

WHAT IS CLAIMED IS:

1. A ESD protection structure having a single crystal Si-sided diode used to protect an internal circuit, the ESD protection structure electrically connected between an input pad and a node and the internal circuit electrically connected to the node, the ESD protection structure comprising:

a single crystal Si resistor formed over an insulating material layer, electrically coupled between the input pad and the node; and

at least a single crystal silicon-sided junction diode formed over the insulating material layer, wherein each of the diodes is electrically coupled between one terminal of a corresponding power supply and a node.

2. The structure according to claim 1, wherein the insulating material layer is made of oxide.

3. The structure according to claim 1, wherein the insulating material layer includes a SOI.

4. The structure according to claim 1, further comprising an input buffer electrically coupled between the node and the internal circuit.

5. The structure according to claim 1, wherein the single crystal resistor is made of a single silicon layer on the insulating material layer.

6. The structure according to claim 1, wherein the single crystal Si-sided junction diode includes a P/N junction formed on the insulating material layer.

7. The structure according to claim 1, wherein the single crystal Si-sided junction diode includes a MOS transistor formed over the insulating material layer, and one of the source/drain region of the MOS electrically connects to a gate by a wiring line.

8. The structure according to claim 1, wherein the single crystal Si-sided junction diodes comprises:

a first diode, electrically connected between the node and one terminal of a first power supply; and

a second diode, electrically connected between the node and one terminal of a second power supply.

9. A ESD protection structure having a single crystal Si-sided diode used to protect an internal circuit formed from an insulating material layer on a SOI, the ESD protection structure electrically connected between an input pad and a node and the internal circuit electrically connected to the node, the ESD protection structure comprising:

an input resistor including a plurality of single resistors formed over the insulating material layer, wherein each of the single resistors is electrically coupled between the input pad and the node; and

at least a single crystal sided junction diode formed over the insulating material layer, wherein each of the diodes is electrically coupled between one terminal of a corresponding power supply and a node.

10. The structure according to claim 9, further comprising an input buffer electrically coupled between the node and the internal circuit.

11. The structure according to claim 9, wherein the single crystal resistor is made from a single silicon layer on the insulating material layer.

12. The structure according to claim 9, wherein the single crystal Si-sided junction diode includes a P/N junction formed on the insulating material layer.

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13. The structure according to claim 9, wherein the single crystal Si-sided junction diode includes a MOS transistor formed over the insulating material layer, and one of the source/drain region of the MOS electrically connects to a gate by a wiring line.

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5 14. A semiconductor structure of ESD protection, the ESD protection electrically connects between an input pad and an integrated circuit, the semiconductor structure comprising:

a semiconductor substrate;

an insulating layer, formed on the semiconductor substrate;

10 at least a single crystal Si resistor, formed over the insulating layer;

at least a single crystal Si-sided junction diode, formed over the insulating layer;

a first conductive layer, formed over the insulating layer, used to electrically connect one terminal of the single crystal Si resistor and the input;

a second conductive layer, formed over the insulating layer, used to electrically connect another terminal of the single crystal Si resistor and the integrated circuit; and

15 a third conductive layer, formed over the insulating layer, used to connect the single crystal Si-sided junction diode and the integrated circuit.

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15. The structure according to claim 14, wherein the single crystal Si resistor includes a single crystal silicon layer.

20 16. The structure according to claim 14, wherein the single crystal sided junction diode includes a single crystal silicon P/N junction.

17. The structure according to claim 14, wherein the single crystal Si-sided junction diode includes a MOS transistor, and one source/drain region of the MOS electrically connects to a gate by a wiring line.

18. The structure according to claim 14, wherein at least a single crystal Si resistor includes a plurality of single crystal Si resistors.

19. The structure according to claim 18, wherein the single crystal Si resistors are isolated by an isolation structure.

20. The structure according to claim 19, wherein the isolation structure includes a shallow trench isolation.

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